

# **Manufacturing Workforce in Wyoming**

**Economically Needed Diversity Options for Wyoming (ENDOW)**



**Research & Planning  
Wyoming DWS**

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## Economically Needed Diversity Options for Wyoming (ENDOW)

**April 2017**

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**“Your Source for Wyoming Labor Market Information”**

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Research & Planning (R&P) functions as an exclusively statistical entity within the Wyoming Department of Workforce Services. R&P collects, analyzes, and publishes timely and accurate labor market information (LMI) meeting established statistical standards. We work to make the labor market more efficient by providing the public and the public’s representatives with the information needed for evidence-based, informed decision making.



# Manufacturing Workforce in Wyoming

## Economically Needed Diversity Options for Wyoming (ENDOW)

by: Tom Gallagher, Research & Planning Manager

This report from the Research & Planning (R&P) section of the Wyoming Department of Workforce Services addresses the question raised in state legislation enacted in spring 2017 regarding economic diversification. It addresses existing workforce strengths and deficiencies as they apply to manufacturing in Wyoming. This report also creates an inventory of those conditions.

To some extent, manufacturing in Wyoming is unique because it is often tied directly to available natural resources rather than to the assembly of inputs from other locations for re-export, as is the case in other states. Rather than access to markets or proximity to transportation, the driver for manufacturing in Wyoming is natural resources readily extracted from the environment. This means that manufacturing is vulnerable to contractions in energy prices in bad times, or becomes a donor of labor to the mining industry during boom times, during which it manufactures equipment. In times of rapid expansion in the mining industry, among the first sources of labor for mining are the workers in manufacturing who build the equipment used in the mining industry. Any view of strengths and deficiencies of the workforce needs to be cognizant of the broader economic context.

Almost all of the information in this report about jobs and payrolls comes from employers' Unemployment Insurance (UI) tax forms submitted to Departments of Workforce Services in the states. State research offices obtain these quarterly

UI tax records, edit them for quality and consistency and supplement them with employer surveys under contract to the U.S. Department of Labor's Bureau of Labor Statistics (BLS). Known as the Quarterly Census of Employment and Wages (QCEW), these employer payroll numbers are the single largest component of gross state and gross national products. This is the *demand side* of the equation, and we can learn much about human resource requirements by examining the characteristics of jobs.

The *supply side* of inventorying "... existing workforce strengths and deficiencies..." is more problematic than the demand side (Enrolled Act No. 64, 2017). Unlike mandatory employment taxes, measurement systems of labor supply (persons) are neither readily available nor produced automatically at meaningful levels of geography. The supply side of the market is identified through household and employer surveys and through the process of merging UI employer records with other administrative records. Because manufacturing is a relatively small industry in Wyoming, survey sample sizes must be large in order to obtain reliable results. Since sample surveys are costly, supply side information is scarce.

Throughout this report, the workforce is defined as persons working. Persons working are usually presented as part of a primary industry, the industry in which they earned the greatest amount of wages. In 2015, there were 11,684 persons whose primary industry of employment

was manufacturing. This represented 3.2% of all persons working in a UI insured or covered job. Jobs represent attributes of persons working. Most information about the workforce comes through information about jobs – e.g. educational requirements, wage rates, benefits, and tenure. These represent job measures rather than person measures. Persons change jobs and often hold more than one job at a time. Therefore, our knowledge of the workforce is often indirect, inferred from the characteristics of work. This report includes information both about persons directly, and about jobs worked.

A later segment of this report provides a brief description of R&P’s 2011 five-part series of articles from a special Manufacturing-Works survey of the industry. This later segment also touches briefly on an initiative of the Manufacturing Institute, which recognizes the nationwide shortage of information about non-credit postsecondary awards. This shortage also limits what is systematically known in Wyoming regarding training outcomes (job attainment, earnings, and retention) as a function of these postsecondary awards.

On April 6, 2017, R&P submitted information on fourth quarter 2016 (2016Q4) UI payroll of \$3.1 billion (QCEW) to BLS. This submittal showed the seventh consecutive quarter of contraction in total payroll and related jobs in Wyoming. The current decline in Wyoming’s payroll is two quarters longer than the contraction associated with the coal bed methane downturn that occurred from first quarter 2009 through first quarter 2010. Currently available statistics suggest that although the rate of contraction in first

quarter 2017 may be slowing, it still seems that Wyoming will experience at least two full years of labor market contraction.

Much of the workforce and jobs information in this report was developed during the downturn and any assessment of “strengths and deficiencies” of the workforce is an assessment made at one point in time during the business cycle. Focusing just on a fixed point in time provides few clues about the future. Therefore, this report emphasizes not just the current structure of the manufacturing market, but workforce development and market forces that may play out in the future.

## Demographics and Nativity

In general, compared to most other states, Wyoming’s labor market is characterized by cyclical and seasonal volatility. This volatility means a dependency on *nonresidents*<sup>1</sup> for much of the workforce as the market bids up wages during peak periods and loses jobs rapidly during off-peak seasons and downturns.

Based on household survey estimates from the Census Bureau, in 2015, only two in five residents of Wyoming were born in Wyoming (Research & Planning, in press). Dependence on a nonresident workforce implies that employer recruitment efforts need to go further afield and cost more than if their needs are met locally. Similarly, job seekers must make greater effort to find work over long distances. In 2015,

<sup>1</sup> *Nonresidents* are individuals for whom demographic data are not available.

about one in five persons working in Wyoming was a nonresident (see Table 1 and Figure 1). On the other hand, a smaller proportion (16.1%) of those working in manufacturing were nonresidents.

As can be seen in Table 1, during 2015 males made up 66.3% of workers in manufacturing but only 42.6% of workers in all industries. Females made up 17.6% of workers

### Persons Working in Wyoming

Table 1: Number of Persons Working in Manufacturing (NAICS<sup>a</sup> 31-33) and All Industries in Wyoming by Gender, 2015

Gender	Manufacturing			All Industries		
	N	%	Average Annual Wage	N	%	Average Annual Wage
Females	2,054	17.6	\$32,963	132,473	36.5	\$28,611
Males	7,746	66.3	\$59,989	154,426	42.6	\$47,496
Nonresidents	1,884	16.1	\$30,122	75,615	20.9	\$19,950
<b>Total</b>	<b>11,684</b>	<b>100.0</b>	<b>\$50,422</b>	<b>362,514</b>	<b>100.0</b>	<b>\$34,849</b>

Nonresidents are individuals for whom demographic data are not available.

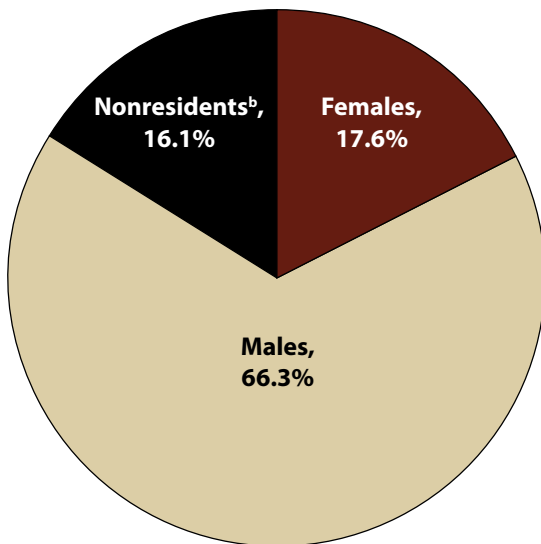
<sup>a</sup>North American Industry Classification System.

Source: Employment and Earnings by Industry, County, Age, & Gender, 2000-2015 ([http://doe.state.wy.us/LMI/earnings\\_tables/2016/Index.htm](http://doe.state.wy.us/LMI/earnings_tables/2016/Index.htm)). Research & Planning, WY DWS.

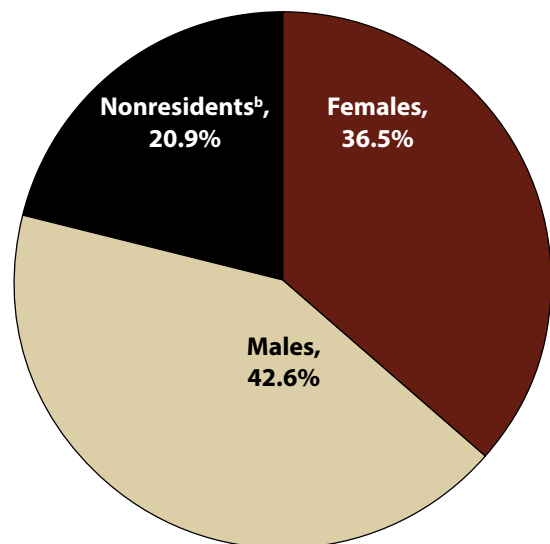
Prepared by M. Moore, Research & Planning, WY DWS, 4/21/17.

### Persons Working in Wyoming by Gender

Manufacturing (NAICS 31-33)  
N = 11,684



All Industries  
N = 362,514



<sup>a</sup>North American Industry Classification System.

<sup>b</sup>Nonresidents are individuals for whom demographic data are not available.

Source: Employment and Earnings by Industry, County, Age, & Gender, 2000-2015 ([http://doe.state.wy.us/LMI/earnings\\_tables/2016/Index.htm](http://doe.state.wy.us/LMI/earnings_tables/2016/Index.htm)). Research & Planning, WY DWS.

Prepared by M. Moore, Research & Planning, WY DWS, 4/24/17.

Figure 1: Number of Persons Working in Manufacturing (NAICS 31-33) and All Industries in Wyoming by Gender, 2015

in manufacturing, with the balance of nonresidents of unknown gender. Workers in manufacturing also tend to be older than the workforce as a whole, with 15.5% of workers in manufacturing age 55-64 compared to 12.9% of workers in all industries (see Table 2). To the extent that age is a predictor of retirement, a weakness in the manufacturing workforce is the greater need to plan for its replacement than in the market as a whole.

than female workers in the economy of Wyoming as a whole during 2015. Gross earnings levels, i.e. \$59,989 for males, in Table 1 may be different than rates of compensation as a function of multiple job holding, turnover, and the exclusion of over-time pay, profit sharing, holiday bonuses, and other forms of non-standard pay from BLS occupational wage surveys displayed in tables presented later in this report.

**Earnings**

Higher earnings in manufacturing may be considered an asset to the degree that they mitigate recruitment and retention problems. As can be seen in Table 1 (see page 5), both genders, as well as nonresidents working in manufacturing made substantially more in comparison to all workers. Females, for example, earned \$32,963 on average, or 15.2% more

**Turnover**

Certain segments of manufacturing in Wyoming are tied directly to food processing, resulting in a marked component of employment seasonality. However, with higher earnings and an overall lower level of turnover characteristic of manufacturing as a whole (see Figure 2, page 7), workers in manufacturing are more likely to enjoy greater employment security by virtue

**Residents Working in Wyoming by Gender and Age**

Table 2: Number of Wyoming Residents Working in Manufacturing (NAICS<sup>a</sup> 31-33) and All Industries in Wyoming by Gender and Age, 2015

Age Group	Manufacturing (NAICS 31-33)						All Industries						
	Females		Males		Total		Females		Males		Total		
	N	Column %	N	Column %	N	Column %	N	Column %	N	Column %	N	Column %	
<20	113	5.5	204	2.6	317	2.7	<20	9,960	7.5	9,931	6.4	19,891	5.5
20-24	185	9.0	754	9.7	939	8.0	20-24	15,337	11.6	17,331	11.2	32,668	9.0
25-34	432	21.0	1,903	24.6	2,335	20.0	25-34	29,547	22.3	36,779	23.8	66,326	18.3
35-44	403	19.6	1,616	20.9	2,019	17.3	35-44	24,987	18.9	30,235	19.6	55,222	15.2
45-54	424	20.6	1,527	19.7	1,951	16.7	45-54	23,385	17.7	26,728	17.3	50,113	13.8
55-64	386	18.8	1,424	18.4	1,810	15.5	55-64	21,978	16.6	24,765	16.0	46,743	12.9
65+	111	5.4	318	4.1	429	3.7	65+	7,252	5.5	8,638	5.6	15,890	4.4
<b>Total</b>	<b>2,054</b>	<b>100.0</b>	<b>7,746</b>	<b>100.0</b>	<b>11,684</b>	<b>100.0</b>	<b>Total</b>	<b>132,473</b>	<b>100.0</b>	<b>154,426</b>	<b>100.0</b>	<b>362,514</b>	<b>100.0</b>

Excludes 1,884 nonresidents<sup>b</sup>. Excludes 75,615 nonresidents.

<sup>a</sup>North American Industry Classification System.

<sup>b</sup>Nonresidents are individuals for whom demographic data are not available.

Source: Employment and Earnings by Industry, County, Age, & Gender, 2000-2015 ([http://doe.state.wy.us/LMI/earnings\\_tables/2016/Index.htm](http://doe.state.wy.us/LMI/earnings_tables/2016/Index.htm)). Research & Planning, WY DWS.

Prepared by M. Moore, Research & Planning, WY DWS, 4/21/17.

of the fact that they are eligible for Unemployment Insurance benefits should they lose their jobs through no fault of their own. As can be seen in Table 3, 94.4% of jobs in manufacturing were monetarily eligible for UI were they to lose their jobs in comparison to 88.5% of all workers in 2016Q3. To the extent that UI income sustains the job search and the attempt to return to work by UI claimants, employers have a greater probability of retaining workers in manufacturing than in the labor market as a whole. Longer tenure and higher wages than in the market as a whole are an advantage for both employer and worker.

Not only is job turnover

## Monetary Eligibility

**Table 3: Unemployment Insurance Benefit Eligibility for Individuals Working in Manufacturing (NAICS<sup>a</sup> 31-33) and All Industries in Wyoming, 2016Q3**

Industry	Eligible		Not Eligible		Total	
	N	Row %	N	Row %	N	Column %
Manufacturing	9,086	94.4	540	5.6	9,626	3.8
Total, All Industries	222,853	88.5	29,144	11.5	252,997	100.0

For Wyoming workers who worked in 2016Q3 and the base period.

<sup>a</sup>North American Industry Classification System.

Source: Wage Records administrative database and Unemployment Insurance claims program. Research & Planning, WY DWS.

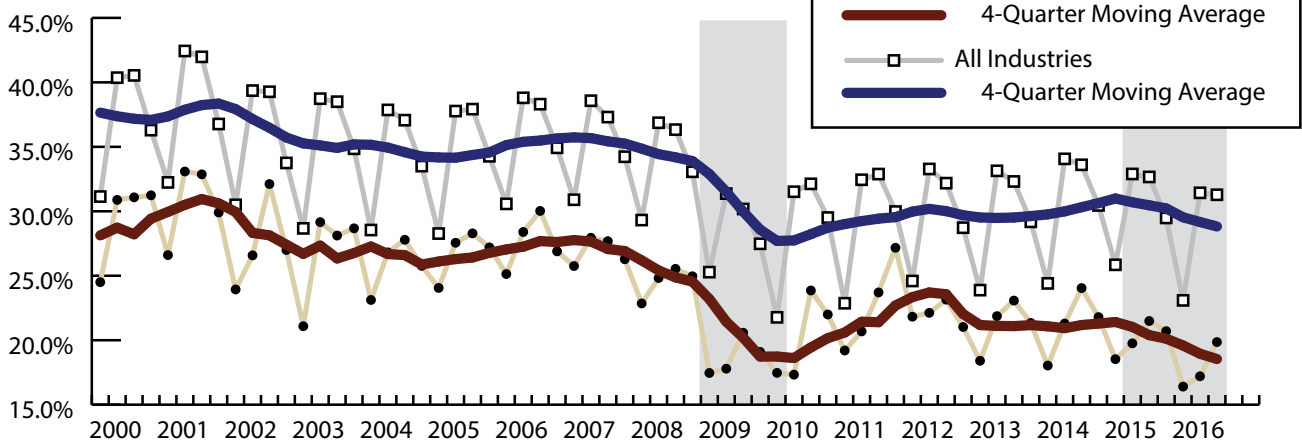
Prepared by S. Wen and M. Moore, Research & Planning, WY DWS, 4/21/17.

***“Monetary criteria require unemployed workers to have earned sufficient wage credits during their base period. The base period is the first four of the last five completed calendar quarters preceding the one in which an unemployed worker filed an initial claim for UI benefits. There are two monetary criteria in Wyoming. First, the unemployed individual’s base period wage must be at least 8% of the statewide average annual wage (minimum wage requirement). ... Second, the individual’s total base period wage must be at least 1.4 times his or her high quarter wages in the base period (high quarter wage requirement).”***

### Reference

Wen, S. (2015, September). What proportion of Wyoming workers would be eligible if they lost their jobs? *Wyoming Labor Force Trends*, 52(9). Retrieved April 21, 2017, from <http://doe.state.wy.us/LMI/trends/0915/a1.htm>

## Turnover Rate



Shaded areas indicate periods of economic downturn: 2009Q1-2010Q1 and 2015Q2-2016Q3 (most recent data).

Source: Wage Records database. Research & Planning, WY DWS.

Prepared by M. Moore, Research & Planning, 4/25/17.

**Figure 2: Turnover Rates for Manufacturing (NAICS 31-33) and All Industries in Wyoming, 2000Q1 to 2016Q3.**

### Full- and Part-Time Workers

**Table 4: Full- and Part-Time Status for Workers Ages 16 and Older in Manufacturing (NAICS<sup>a</sup> 31-33) in Wyoming and the U.S., 2015<sup>b</sup>**

Status	Wyoming		U.S.	
	N	%	N	%
Full-Time	11,712	80.3	15,126,614	81.4
Part-Time	1,668	11.4	1,289,674	6.9
N/A	1,210	8.3	2,177,649	11.7
<b>Total</b>	<b>14,590</b>	<b>100.0</b>	<b>18,593,937</b>	<b>100.0</b>

<sup>a</sup>North American Industry Classification System.

<sup>b</sup>Five-year estimates, 2011-2015.

N/A = Were not in the labor force during past year or were unemployed.

Full-Time = 35 or more hours worked.

Source: IPUMS/U.S. Census Bureau American Community Survey.

Prepared by L. Knapp, Research & Planning, WY DWS, 4/25/17.

lower in manufacturing than in other industries in Wyoming, workers in manufacturing whether in Wyoming or the U.S. are highly likely to be working full-time. According to a U.S. Census Bureau program, over 80% of employed workers in manufacturing were working full-time (35 hours or more per week) based on averages over five years of household surveys from 2011 to 2015 (see Table 4).

#### Structure and Composition of Demand: Industry

In 2016Q3, six quarters into the current downturn in Wyoming, jobs in manufacturing made up 4.4% of all UI covered jobs compared to 10.2% of all covered jobs in the U.S.

On the other hand, despite the relatively small size of the manufacturing industry in Wyoming, employment is distributed across a wide variety of sub-sectors. Table 5 (see page 9) is comprised of three sectors and 21 sub-sectors at the three-digit North American Industrial

Classification System (NAICS) level of description of firms and employment. On the other hand, in contrast to employment in the U.S. (see Figure 3, page 10) there is a greater concentration of firms and employment in petroleum & coal, chemical, plastics, and nonmetallic mineral product manufacture in Wyoming. The concentration of economic activity in carbon-based manufacturing and supporting manufacturing of equipment, and selected firms in plastics and metal manufacturing in support of minerals extraction tends to tie manufacturing employment change in several of these sub-sectors to the fortunes of the mining industry.

#### Structure and Composition of Demand: Occupation

BLS funds R&P’s employer survey collection of occupational staffing and wage rate information for jobs from a random sample of the 606 firms in manufacturing (see Table 5) as part of the Occupational Employment Statistics (OES) program. OES estimates of employment and wage rates are found in Table 6 (see pages 11-12) and Table 7 (see page 13). OES uses a hierarchical system of classifying jobs into general categories (e.g. SOC 11-0000 management occupations) and more specialized categories of jobs (e.g. SOC 11-3051 industrial production managers). When insufficient data are available for reliable estimates of specialized categories of occupations, a more general category can be published which summarizes occupational demand.

Table 6 presents both general and

(Text continued on page 11)



## Manufacturing by 3-Digit NAICS

Table 5: Number of Firms and Average Monthly Jobs Worked in Manufacturing by Sub-sector (3-Digit NAICS<sup>a</sup> Code) in Wyoming and the U.S., 2016Q3

NAICS Code	Industry	Wyoming				U.S.			
		Firms		Average Monthly Jobs Worked		Firms		Average Monthly Jobs Worked	
		N	%	N	%	N	%	N	%
	<b>All Industries</b>	<b>26,259</b>		<b>275,834</b>		<b>9,800,801</b>		<b>141,978,342</b>	
31-33	Manufacturing	606	100.0	9,258	100.0	345,206	100.0	12,357,062	100.0
311	Food Manufacturing	72	11.9	673	7.3	32,707	9.5	1,576,418	12.8
312	Beverage & Tobacco Product Manufacturing	33	5.4	452	4.9	9,929	2.9	258,124	2.1
313	Textile Mills	N/D	N/D	N/D	N/D	2,810	0.8	112,836	0.9
314	Textile Product Mills	26	4.3	135	1.5	6,682	1.9	115,758	0.9
315	Apparel Manufacturing	N/D	N/D	N/D	N/D	6,869	2.0	128,139	1.0
316	Leather & Allied Product Manufacturing	9	1.5	20	0.2	1,361	0.4	29,203	0.2
321	Wood Product Manufacturing	31	5.1	532	5.7	14,723	4.3	394,553	3.2
322	Paper Manufacturing	N/D	N/D	N/D	N/D	5,499	1.6	369,366	3.0
323	Printing & Related Support Activities	44	7.3	265	2.9	28,847	8.4	446,592	3.6
324	Petroleum & Coal Products Manufacturing	17	2.8	1,398	15.1	2,328	0.7	113,202	0.9
325	Chemical Manufacturing	30	5.0	1,896	20.5	17,674	5.1	814,776	6.6
326	Plastics & Rubber Products Manufacturing	7	1.2	233	2.5	13,229	3.8	703,827	5.7
327	Nonmetallic Mineral Product Manufacturing	47	7.8	884	9.5	16,310	4.7	412,685	3.3
331	Primary Metal Manufacturing	3	0.5	85	0.9	5,535	1.6	370,813	3.0
332	Fabricated Metal Product Manufacturing	119	19.6	1,265	13.7	58,426	16.9	1,411,754	11.4
333	Machinery Manufacturing	43	7.1	538	5.8	30,073	8.7	1,066,205	8.6
334	Computer & Electronic Product Manufacturing	15	2.5	153	1.7	19,669	5.7	1,046,226	8.5
335	Electrical Equipment & Appliance Manufacturing	13	2.1	193	2.1	8,022	2.3	381,145	3.1
336	Transportation Equipment Manufacturing	11	1.8	184	2.0	14,789	4.3	1,623,764	13.1
337	Furniture & Related Product Manufacturing	36	5.9	185	2.0	17,673	5.1	390,381	3.2
339	Misc. Manufacturing	44	7.3	153	1.7	32,051	9.3	591,294	4.8

N/D = Not discloseable due to confidentiality.

<sup>a</sup>North American Industry Classification System.

Source: Quarterly Census of Employment and Wages. U.S. Bureau of Labor Statistics.

Prepared by M. Moore, Research & Planning, WY DWS, 4/24/17.

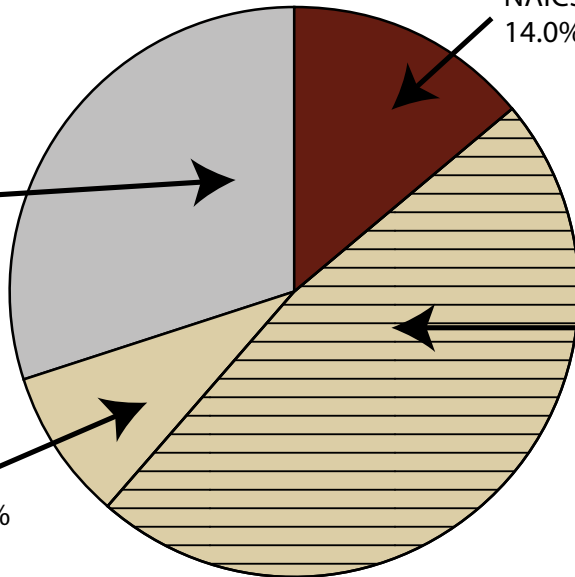
### Manufacturing by 2-Digit NAICS<sup>a</sup>

**Wyoming**  
**N = 9,258**

NAICS 33  
(Machinery,  
Computers,  
Electrical &  
Transportation),  
29.8%

NAICS 32  
(Balance), 8.6%

NAICS 31 (Food, Beverage, & Textile),  
14.0%



**NAICS 324-327 = 47.6% of all manufacturing in Wyoming.**

- NAICS 324 - Petroleum & Coal Products Manufacturing
- NAICS 325 - Chemical Manufacturing
- NAICS 326 - Plastics & Rubber Products Manufacturing
- NAICS 327 - Nonmetallic Mineral Product Manufacturing

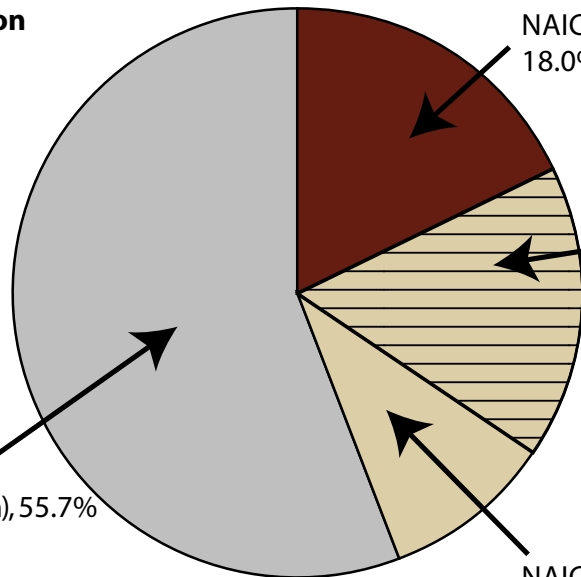
**U.S.**  
**N = 12.4 Million**

NAICS 33  
(Machinery,  
Computers,  
Electrical &  
Transportation), 55.7%

NAICS 31 (Food, Beverage, & Textile),  
18.0%

NAICS 324-327,  
16.5%

NAICS 32 (Balance),  
9.8%



<sup>a</sup>North American Industry Classification System.

Source: Quarterly Census of Employment and Wages. U.S. Bureau of Labor Statistics.

Prepared by M. Moore, Research & Planning, WY DWS, 4/24/17.

Figure 3: Distribution of Jobs by Two-Digit NAICS Code in Wyoming and the U.S., 2016Q3

(Text continued from page 8)

selected specialized occupations for manufacturing. Only general categories are presented in Table 7 for all occupations in Wyoming for the sake of illustrating contrasts between manufacturing and the workplace as a whole.

In comparing general categories of occupations in Table 6 and Table 7, the (estimates for 2016) chief distinctions in occupational demand are found in the overrepresentation of installation, maintenance & repair occupations at 11.7% of all jobs in manufacturing, compared to 6.3% of all wage and salary jobs. Production occupations make up nearly half (47.6%) of all jobs in manufacturing compared to

4.6% of all jobs. Some of the larger segments of production occupations are first line production supervisors, machinists, welders, petroleum pump system operators, and production worker helpers. Architectural and engineering jobs are about twice as likely to occur in manufacturing (at 4.1%) as in all jobs (1.8%) worked.

The hourly rate of compensation in manufacturing, at \$23.76, is 27.7% above the average wage in the market as a whole. The average annual wage for the general category of production occupations (SOC 51-000) is \$45,456 with wide variation from \$79,322 for chemical equipment operators (SOC 51-9011) to \$27,690 for

(Text continued on page 13)

## Occupations in Manufacturing

Table 6: Jobs Worked and Median Wages in Manufacturing (NAICS<sup>a</sup> 31-33) in Wyoming by Occupation, 2016

SOC <sup>b</sup> Code	Occupation	Jobs Worked		Median Wages	
		N	%	Hourly	Annual
<b>Total, All Occupations</b>		<b>9,440</b>	<b>100.0</b>	<b>\$23.76</b>	<b>\$49,431</b>
11-0000	Management Occupations	490	5.2	\$54.48	\$113,310
11-1021	General & Operations Managers	280		\$45.62	\$94,897
11-3051	Industrial Production Managers	90		\$56.63	\$117,786
13-0000	Business & Financial Operations Occupations	280	3.0	\$37.55	\$78,110
15-0000	Computer & Mathematical Occupations	40	0.4	\$35.20	\$73,222
17-0000	Architecture & Engineering Occupations	390	4.1	\$42.81	\$89,054
17-2041	Chemical Engineers	70		\$50.43	\$104,900
17-2112	Industrial Engineers	90		\$44.67	\$92,909
19-0000	Life, Physical, & Social Science Occupations	100	1.1	\$34.61	\$71,986
19-4031	Chemical Technicians	70		\$34.52	\$71,806
27-0000	Arts, Design, Entertainment, Sports, & Media Occupations	90	1.0	\$19.75	\$41,089
27-1024	Graphic Designers	80		\$18.86	\$39,228
29-0000	Healthcare Practitioners & Technical Occupations	60	0.6	\$40.39	\$84,005
33-0000	Protective Service Occupations	10	0.1	\$25.32	\$52,656
35-0000	Food Preparation & Serving-Related Occupations	90	1.0	\$8.92	\$18,560
37-0000	Building and Grounds Cleaning & Maintenance Occupations	60	0.6	\$16.11	\$33,501
41-0000	Sales and Related Occupations	270	2.9	\$23.81	\$49,526

<sup>a</sup>North American Industry Classification System.

<sup>b</sup>Standard Occupational Classification.

Source: Occupational Employment Statistics May 2016 estimates. U.S. Bureau of Labor Statistics files using the LEWIS system. Prepared by D. Hauf, Research & Planning, WY DWS, 4/20/17.

(Table continued on page 12)

(Table continued from page 11)

## Occupations in Manufacturing

Table 6: Jobs Worked and Median Wages in Manufacturing (NAICS<sup>a</sup> 31-33) in Wyoming by Occupation, 2016

SOC <sup>b</sup> Code	Occupation	Jobs Worked		Median Wages	
		N	%	Hourly	Annual
41-2031	Retail Salespersons	60		\$11.14	\$23,178
41-4012	Sales Reps., Wholesale & Manufacturing, Exc. Tech. & Scientific Products	150		\$27.28	\$56,736
43-0000	Office & Administrative Support Occupations	890	9.4	\$17.59	\$36,588
43-3031	Bookkeeping, Accounting, & Auditing Clerks	130		\$19.27	\$40,088
43-4051	Customer Service Representatives	50		\$20.35	\$42,319
43-5071	Shipping, Receiving, & Traffic Clerks	80		\$14.86	\$30,918
43-6014	Secretaries & Administrative Assistants, Except Legal, Medical	150		\$15.75	\$32,762
43-9061	Office Clerks, General	280		\$15.94	\$33,146
47-0000	Construction & Extraction Occupations	180	1.9	\$23.07	\$47,979
47-2111	Electricians	50		\$32.39	\$67,371
49-0000	Installation, Maintenance, & Repair Occupations	1,100	11.7	\$34.27	\$71,283
49-1011	First-Line Supervisors of Mechanics, Installers, & Repairers	110		\$45.37	\$94,371
49-9041	Industrial Machinery Mechanics	320		\$30.67	\$63,802
49-9043	Maintenance Workers, Machinery	50		\$28.13	\$58,506
49-9071	Maintenance & Repair Workers, General	550		\$37.05	\$77,056
51-0000	Production Occupations	4,490	47.6	\$21.85	\$45,456
51-1011	First-Line Supervisors of Production & Operating Workers	410		\$30.45	\$63,327
51-2022	Electrical and Electronic Equipment Assemblers	80		\$18.75	\$39,005
51-2041	Structural Metal Fabricators & Fitters	50		\$18.05	\$37,546
51-2092	Team Assemblers	220		\$16.33	\$33,964
51-3021	Butchers & Meat Cutters	40		\$13.09	\$27,235
51-4041	Machinists	310		\$20.63	\$42,909
51-4072	Molding, Coremaking, & Casting Machine Setters, Operators, & Tenders, Metal & Plastic	60		\$13.10	\$27,243
51-4121	Welders, Cutters, Solderers, & Brazers	510		\$23.44	\$48,755
51-5112	Printing Press Operators	90		\$14.51	\$30,190
51-6031	Sewing Machine Operators	90		\$13.31	\$27,690
51-7011	Cabinetmakers & Bench Carpenters	100		\$19.05	\$39,618
51-7041	Sawing Machine Setters, Operators, & Tenders, Wood	80		\$14.76	\$30,693
51-8091	Chemical Plant & System Operators	280		\$35.89	\$74,653
51-8093	Petroleum Pump System Operators, Refinery Operators, & Gaugers	540		\$33.81	\$70,319
51-9011	Chemical Equipment Operators & Tenders	70		\$38.14	\$79,322
51-9023	Mixing & Blending Machine Setters, Operators, & Tenders	130		\$16.76	\$34,857
51-9061	Inspectors, Testers, Sorters, Samplers, & Weighers	180		\$19.09	\$39,711
51-9111	Packaging and Filling Machine Operators & Tenders	130		\$14.92	\$31,040
51-9121	Coating, Painting, & Spraying Machine Setters, Operators, & Tenders	100		\$19.42	\$40,399
51-9198	Helpers--Production Workers	250		\$18.03	\$37,500
53-0000	Transportation & Material Moving Occupations	880	9.3	\$17.48	\$36,359
53-3032	Heavy & Tractor-Trailer Truck Drivers	300		\$18.46	\$38,404
53-7051	Industrial Truck & Tractor Operators	90		\$17.77	\$36,956
53-7062	Laborers & Freight, Stock, & Material Movers, Hand	150		\$17.18	\$35,738
53-7064	Packers & Packagers, Hand	150		\$11.47	\$23,853

<sup>a</sup>North American Industry Classification System.<sup>b</sup>Standard Occupational Classification.

Source: Occupational Employment Statistics May 2016 estimates. U.S. Bureau of Labor Statistics files using the LEWIS system. Prepared by D. Hauf, Research &amp; Planning, WY DWS, 4/20/17.

(Text continued from page 11)

sewing machine operators (SOC 51-6031). There is a substantial amount of diversity in the composition of manufacturing whether viewed from an industry (what firms do) or occupational (functions of jobs) perspective.

Higher wages tend to be associated with lower turnover and therefore lower recruitment and replacement costs when compared to all industries. Moreover, as the literature on manufacturing in Wyoming has shown in the past, lower wage occupations are often the subject of shorter-term employment and higher turnover.

### Benefits

Workers in manufacturing are also more likely to be offered such benefits (see Table 8, page 14) as medical insurance, paid holidays, and retirement than workers as a whole. Higher earnings and the availability of benefits can contribute to viable local economies through worker spending, and in the case of health care, a greater likelihood of utilizing the local health care delivery system and enhancing the probability of its local continuation.

However, benefits offerings are associated with firms' size and full-

## Occupations in All Industries

Table 7: Jobs Worked and Median Wages Across All Industries in Wyoming by Occupation, 2016

SOC <sup>a</sup> Code	Occupation	Jobs Worked		Median Wages	
		N	%	Hourly	Annual
<b>Total, All Occupations</b>		276,120	100.0	\$18.61	\$38,713
11-0000	Management Occupations	11,430	4.1	\$41.89	\$87,134
13-0000	Business & Financial Operations Occupations	8,480	3.1	\$28.48	\$59,246
15-0000	Computer & Mathematical Occupations	2,650	1.0	\$28.16	\$58,573
17-0000	Architecture & Engineering Occupations	4,860	1.8	\$34.35	\$71,456
19-0000	Life, Physical, & Social Science Occupations	4,200	1.5	\$25.90	\$53,870
21-0000	Community & Social Services Occupations	4,090	1.5	\$21.93	\$45,608
23-0000	Legal Occupations	1,580	0.6	\$30.14	\$62,687
25-0000	Education, Training, & Library Occupations	20,230	7.3	\$22.58	\$46,968
27-0000	Arts, Design, Entertainment, Sports, & Media Occupations	3,070	1.1	\$17.08	\$35,524
29-0000	Healthcare Practitioners & Technical Occupations	14,300	5.2	\$29.37	\$61,085
31-0000	Healthcare Support Occupations	6,630	2.4	\$14.10	\$29,332
33-0000	Protective Service Occupations	5,980	2.2	\$19.75	\$41,081
35-0000	Food Preparation & Serving-Related Occupations	25,180	9.1	\$9.91	\$20,604
37-0000	Building & Grounds Cleaning and Maintenance Occupations	11,670	4.2	\$12.45	\$25,894
39-0000	Personal Care & Service Occupations	8,110	2.9	\$11.38	\$23,661
41-0000	Sales & Related Occupations	25,320	9.2	\$12.71	\$26,427
43-0000	Office & Administrative Support Occupations	36,190	13.1	\$16.06	\$33,409
45-0000	Farming, Fishing, & Forestry Occupations	500	0.2	\$14.23	\$29,588
47-0000	Construction & Extraction Occupations	27,890	10.1	\$22.88	\$47,593
49-0000	Installation, Maintenance, & Repair Occupations	17,380	6.3	\$24.79	\$51,567
51-0000	Production Occupations	12,770	4.6	\$23.44	\$48,765
53-0000	Transportation & Material Moving Occupations	23,600	8.5	\$19.21	\$39,953

<sup>a</sup>Standard Occupational Classification.

Source: Occupational Employment Statistics May 2016 estimates. U.S. Bureau of Labor Statistics files using the LEWIS system. Prepared by D. Hauf, Research & Planning, WY DWS, 4/20/17.

## Benefits

**Table 8: Percent of Wyoming Employers Offering and Percent of Jobs Offered Selected Benefits in Manufacturing (NAICS<sup>a</sup> 31-33) and All Industries, 2015Q3<sup>b</sup>**

Benefit	Employers Offering (%)		Jobs Offered (%)	
	Manufacturing (NAICS 31-33)	All Industries	Manufacturing (NAICS 31-33)	All Industries
Child Care Assistance	0.8	2.4	0.1	8.0
Dental Plan	27.4	23.4	71.1	57.5
Dependent Medical Insurance	31.3	26.4	79.8	60.4
Tuition Assistance	13.9	13.0	44.7	38.6
Flexible Spending	11.1	11.3	44.2	41.4
Hiring Bonus	6.1	4.7	25.7	17.5
Life Insurance	27.0	21.2	74.8	56.5
Long-Term Disability	11.4	10.8	48.4	39.1
Medical Insurance	35.7	32.2	75.6	62.0
Paid Holidays	53.1	40.1	86.4	62.9
Paid Personal Leave	27.9	26.8	47.1	39.5
Paid Sick Leave	16.6	20.3	32.9	41.6
Paid Vacation Leave	42.9	36.6	66.7	56.5
Retirement Plan	32.8	29.3	71.3	62.9
Defined Benefit Retirement Plan	3.2	4.3	13.6	22.2
Defined Contribution Retirement Plan	30.3	27.1	77.1	57.5
Short-Term Disability	13.1	11.6	49.9	36.7
Vision Plan	18.8	16.5	50.1	49.9

<sup>a</sup>North American Industry Classification System.

<sup>b</sup>Estimates based on employment between 2013Q4 and 2015Q3.

Source: Research & Planning, Wyoming DWS. (2016). Wyoming Benefits Survey 2015.

time employment. Since many of the firms in manufacturing, e.g. refineries (see Table 8), tend to be among larger firms, it is not unusual to see employers utilizing indirect compensation as a retention tool. Based on annual publication of employer provided benefits, it is to be noted that smaller firms in manufacturing (e.g. NAICS 316 in Table 5; see page 9) may not offer benefits to the extent identified in Table 9.

### Labor Supply: New Hires

The illustration of turnover in Figure 2 (see page 7) highlights the high volume (although lower than all industries combined) of exits from work in manufacturing and, all else being equal, the high rate of hiring. Hire and exits (turnover) by industry can be found at <http://doe.state.wy.us/LMI/turnover.htm>.

R&P surveys quarterly employer hiring activity by quarter in the New Hires job skills program. R&P conducts a random sample survey of hires from employers to collect information about the

## Firm Size

**Table 9: Number of Jobs Worked by Firm Size in Manufacturing (NAICS<sup>a</sup> 31-33) and All Industries in Wyoming, 2016Q1**

Firm Size (Number of Jobs)	Manufacturing (NAICS 31-33)		All Industries	
	N	%	N	%
Fewer than 5	660	7.1	24,023	12.0
5 to 9	802	8.6	28,438	14.1
10 to 19	1,008	10.9	36,449	18.1
20 to 49	1,653	17.8	46,491	23.1
50 to 99	910	9.8	23,748	11.8
100 to 249	2,175	23.4	20,035	10.0
250 to 499	0	0.0	10,850	5.4
500 to 999	0	0.0	4,916	2.4
1,000 or more	0	0.0	6,046	3.0
<b>All sizes</b>	<b>9,275</b>	<b>100.0</b>	<b>200,996</b>	<b>100.0</b>

<sup>a</sup>North American Industry Classification System.

Source: Quarterly Census of Employment and Wages.

Prepared by M. Moore, Research & Planning, WY DWS, 4/25/17.

characteristics of jobs filled and the conditions of employment. The sample is restricted to employment in firms for which the new hire has never before worked and seeks to exclude temporary jobs. For the most recent four-quarter period, there were 113,204 hires meeting these criteria. Even in the middle of a downturn, some employers continued to hire, although at a lower level than during a period of growth.

The 2015 New Hires Survey estimates for the state, available at [http://doe.state.wy.us/LMI/new\\_hires/2015/toc.htm](http://doe.state.wy.us/LMI/new_hires/2015/toc.htm), reveal that 14.1% of new hires went to nonresidents and that on average 76.6% of all new hires were retained one quarter after hire. On the other hand, in manufacturing, a lower proportion were hired from among nonresidents (10.2%) and the retention rate was higher, with 82.2% of new hires retained after one quarter. In the current market, manufacturers have lower recruitment and

retention costs in comparison to employers in Wyoming as a whole. On the other hand, for certain occupations manufacturers are more dependent on nonresident labor.

The three most frequently occurring occupations for which manufacturers hired in 2015 were also more likely to include nonresidents than the average new hire occupation (10.2%). As can be seen in Table 10, there were an estimated 485 hires of welders (11.9% nonresidents); 150 hires of laborers and freight, stock, & material movers (19.2% nonresidents); and 127 hires of helpers – production workers among whom nonresidents were over represented. Among new hires in manufacturing, half of these same laborers and 31.8% of helpers were age 24 and younger (and predominantly male). These low wage jobs may not serve to hold the interest of young and mobile populations. At lower wages, both the incidence of employment and frequency of

### New Hires: Most Frequently Occurring

Table 10: Selected New Hires Occupations in Manufacturing (NAICS<sup>a</sup> 31-33) in Wyoming, 2015

SOC <sup>b</sup> Code	Occupation	Education	N	Median Hourly Wage (\$)	% Nonresidents <sup>c</sup>	% Retained 1 Quarter After Hire
51-4121	Welders, Cutters, Solderers, & Brazers	High School Diploma or Equivalent	485	18.00	11.9	81.0
53-7062	Laborers & Freight, Stock, & Material Movers, Hand	Less than High School	150	12.00	19.2	88.5
51-9198	Helpers – Production Workers	Less than High School	127	12.00	13.6	68.2
51-2099	Assemblers & Fabricators, All Other	High School Diploma or Equivalent	58	12.00	30.0	100.0
11-1021	General & Operations Managers	Bachelor's Degree	46	30.00	12.5	75.0
53-7051	Industrial Truck & Tractor Operators	Less than High School	46	12.87	12.5	75.0
<b>00-0000</b>	<b>All Occupations</b>	<b>N/A</b>	<b>2,718</b>	<b>15.00</b>	<b>10.2</b>	<b>82.8</b>

<sup>a</sup>North American Industry Classification System.

<sup>b</sup>Standard Occupational Classification.

<sup>c</sup>Nonresidents are individuals for whom demographic data are not available.

Source: New Hires Job Skills Survey, Research & Planning, WY DWS.

Prepared by M. Moore, Research & Planning, WY DWS, 4/25/17.

turnover coincide. Of the six occupations making up relatively large shares of hires in Table 10, four paid an average wage of less than half the 2016 industry average of \$23.76 (see Table 6, page 11) and only one required formal education beyond high school.

New hires represent the appearance of a social security number on an employer UI account for the first time. An individual can be hired several times in the same quarter by different employers for the first time and appear in subsequent employer UI accounts for the first time. Still, it is instructive to note that the annual average number of manufacturing jobs worked in a welding occupation (see Table 6) was estimated at 510. With 485 hires of welders in Table 10, we gain some understanding of the volume of turnover employers experience for this occupation. Similarly, the employment estimate (see Table 6) for laborers and freight stock, and material movers is 150 jobs while the number of new hires was at that same level. The employment level for production worker helper is 250, while hires were estimated at 127. These data at the occupational level begin to give us an appreciation for the dynamics of labor flow.

The New Hires Survey asks employers to rate the importance of five skills to the job and provide an indication as to whether or not they are satisfied that the new employee's skills meet those standards. Employer satisfaction ratings are among the lowest non-response items in the New Hires survey and should be interpreted with care. High non-response to the employer satisfaction question may be a function of the New Hires Survey form completed by human resource staff, rather than by the employee's immediate supervisor.

## Postsecondary Education

The New Hires Survey estimates include both a rating by employers of selected skills and minimum education requirements for the job. In comparison to welders, laborer, and helpers, a relatively small fraction of new hires involved at least some postsecondary educational requirements. When such requirements were present, the wages tended to rise well above the average wage for all hires. Higher wages are generally associated with a reduced need to replace turnover.

Table 11 (see page 17) contains estimates of new hires requiring some postsecondary education to work in manufacturing. Given the small universe of employment, lower levels of turnover, and small sample size, random events can result in lower quality estimates than one would like. One occupation, general & operations managers (SOC 11-1021), is found in both Table 10, which shows that 12.5% of new hires were from among nonresidents, and Table 11, which reveals that employers were satisfied with the skills of the new hire less than 100% of the time. Satisfaction with the skills of first-line supervisors (see Table 11), drafters, and market research analysts were less than optimal. However, the incidents are small and item non-response may be problematic. As such, these results may best serve to inform future research.

Supplementing the analysis of labor supply for occupations requiring some postsecondary from the New Hires survey is the analysis in Table 12 (see page 18) illustrating the number of graduates from Wyoming's Community Colleges and the

(Text continued on page 18)



## New Hires: Some Postsecondary Education

Table 11: Job Skills Identified as Important by Employers in Wyoming's New Hires Job Skills Survey and Percentage of Employers' Satisfied with New Hires' Skills in Manufacturing (NAICS<sup>a</sup> 31-33) in Occupations Requiring Some Postsecondary Education, 2015

SOC <sup>b</sup> Code	SOC Title	Education Required to Enter the Occupation	N	%	Median Hourly Wage	% of Employers Who Identified Job Skill as Important in Manufacturing (NAICS 31-33)					% Satisfied with New Hires' Work Skills
						Service Orientation	Critical Think.	Reading Comp.	Tech. Design	Operation & Control	
<b>00-0000</b>	<b>Total, All Occupations</b>		<b>2,718</b>	<b>100.0</b>	<b>\$15.00</b>	<b>54.4</b>	<b>79.6</b>	<b>66.9</b>	<b>46.7</b>	<b>75.4</b>	<b>49.3</b>
53-3032	Truck Drivers, Heavy & Tractor-Trailer	Postsecondary non-degree award	121	4.5	\$18.00	66.7	95.2	57.1	19.0	100.0	42.9
11-1021	General & Operations Managers	Bachelor's degree	46	1.7	\$30.00	62.5	87.5	87.5	100.0	100.0	62.5
17-2141	Mechanical Engineers	Bachelor's degree	46	1.7	\$34.54	87.5	100.0	100.0	100.0	87.5	62.5
51-1011	First-Line Supervisors/Managers of Production & Operating Workers	Postsecondary non-degree award	29	1.1	\$13.00	80.0	100.0	20.0	0.0	100.0	40.0
17-3019	Drafters, All Other	Associate's degree	23	0.8	\$11.00	100.0	100.0	100.0	100.0	75.0	50.0
13-1161	Market Research Analysts & Market	Bachelor's degree	17	0.6	\$19.71	100.0	100.0	100.0	100.0	100.0	33.3
15-1151	Computer User Support Specialists	Some college, no degree	17	0.6	\$16.85	100.0	100.0	100.0	100.0	66.7	66.7
17-3027	Mechanical Engineering Technicians	Associate's degree	12	0.4	\$17.00	100.0	100.0	100.0	100.0	100.0	50.0
27-1024	Graphic Designers	Bachelor's degree	12	0.4	\$14.75	100.0	100.0	100.0	100.0	100.0	100.0
17-2151	Mining & Geological Engineers, Including Mining Safety Engineers	Bachelor's degree	12	0.4	\$48.08	0.0	100.0	100.0	100.0	100.0	50.0
11-2022	Sales Managers	Bachelor's degree	12	0.4	\$26.80	100.0	100.0	100.0	100.0	100.0	100.0
49-2094	Electrical & Electronics Repairers, Commercial & Industrial Equipment	Postsecondary non-degree award	12	0.4	\$25.38	0.0	100.0	100.0	100.0	100.0	50.0
19-4031	Chemical Technicians	Associate's degree	6	0.2	\$24.64	100.0	100.0	100.0	100.0	100.0	100.0
17-2051	Civil Engineers	Bachelor's degree	6	0.2	\$26.49	100.0	100.0	100.0	100.0	100.0	100.0
29-9011	Occupational Health & Safety Specialists	Bachelor's degree	6	0.2	\$34.38	100.0	100.0	100.0	0.0	100.0	0.0
25-3099	Teachers and Instructors, All Other	Bachelor's degree	6	0.2	\$75.00	0.0	0.0	0.0	0.0	0.0	0.0

<sup>a</sup>North American Industry Classification System.

<sup>b</sup>Standard Occupational Classification

Source: Wyoming New Hires Job Skills Survey. Research & Planning, WY DWS.

Prepared by M. Moore, Research & Planning, WY DWS, 4/21/17.

University of Wyoming who were working in the manufacturing industry two years after graduation. The table combines three academic years and utilizes 2015 real (inflation adjusted) dollars in the hourly wage rate calculations and spans the period of both expansion and contraction in Wyoming’s economy. The data represented in Table 12 reveals that wage rates for those working in manufacturing are frequently higher than wage rates for all New Hires in manufacturing. However, the table also shows that there are only two instances

where more than one-third of graduates are found working in manufacturing: physical science technologies/technicians (one-year certificate) and post-graduate chemistry awards are found working in manufacturing. The category of precision metal working in Table 12 includes the subcategories of machine tool technology (CIP 480501), machine shop technology (CIP 480503), and welding technology (480508). The supply of labor with postsecondary awards from higher education making their way to employment in manufacturing appears

### Postsecondary Graduates

Table 12: Number of Degrees Awarded from a Wyoming Community College or the University of Wyoming Found Working in Manufacturing in Wyoming Two Years After Graduation (2011/12, 2012/13, & 2013/14 Graduates)

College	Program of Study	Degree	Number of Degrees	Working in Manufacturing in WY		
				N	%	Median Hourly Wage
All Community Colleges	Electrical/Electronics Maintenance & Repair Technology	Occupational 1 Year	53	8	15.1	42.56
		Occupational 2 Year	54	11	20.4	30.61
	Engineering, General	Academic	107	8	7.5	26.72
	Heavy/Industrial Equipment Maintenance Technologies	Occupational 2 Year	28	5	17.9	39.67
	Liberal Arts & Sciences, General Studies & Humanities	Academic	1,695	20	1.2	15.77
	Mathematics	Academic	62	6	9.7	16.82
	Physical Science Technologies/Technicians	Occupational 1 Year	44	15	34.1	28.83
	Precision Metal Working	Occupational 1 Year	328	44	13.4	20.94
		Occupational 2 Year	190	29	15.3	21.38
	Teacher Education and Professional Development, Specific Levels & Methods	Academic	514	7	1.4	17.76
	Vehicle Maintenance & Repair Technologies	Occupational 1 Year	257	12	4.7	18.03
Occupational 2 Year		179	10	5.6	24.66	
University of Wyoming	Business Administration, Management & Operations	Masters\Doctorate\ Professional	94	5	5.3	50.09
		Bachelors	61	10	16.4	40.16
	Chemistry	Masters\Doctorate\ Professional	14	5	35.7	38.87
	Electrical, Electronics & Communications Engineering	Bachelors	56	5	8.9	30.88
	Geography and Cartography	Bachelors	50	5	10.0	24.85
	Mechanical Engineering	Bachelors	108	15	13.9	30.32

Source: Consumer Reports: Wyoming Career Assist. Research & Planning, WY DWS. Published February 14, 2017, at [http://doe.state.wy.us/LMI/education\\_we\\_connect/2017/consumer\\_reports\\_intro.htm](http://doe.state.wy.us/LMI/education_we_connect/2017/consumer_reports_intro.htm).

Prepared by T. Glover, Research & Planning, WY DWS, 4/24/17.

to be sufficient. In 15 out of 18 fields of study in which graduation is associated with work in manufacturing, Table 12 shows that fewer than 20% find work in manufacturing two years after graduation (for confidentiality reasons, fields of study are suppressed when cells have fewer than five students). Consumer Reports: Wyoming Career Assist, the source of data in Table 12, includes narrative documentation, tables, and interactive graphics for all fields of postsecondary study in Wyoming and employment outcomes in Wyoming and in 11 states. It may be accessed at [http://doe.state.wy.us/LMI/education\\_wconnect/2017/consumer\\_reports\\_intro.htm](http://doe.state.wy.us/LMI/education_wconnect/2017/consumer_reports_intro.htm).

To move beyond this study, it will be possible to link postsecondary awards to the New Hires Survey to determine which occupations students obtain in manufacturing as part of a broader and consistent long term monitoring of skills requirements. The data in Table 12 provides some indication that selected hires – for example, general & operations managers and first-line supervisors/managers of production and operating

– are “deficient” from the standpoint of employer satisfaction with skills. However, given the issue of item non-response, it appears that these results should be considered suggestive and useful in opening discussions with manufacturers as part of a broader targeted effort.

**Educational Requirements: Discussion**

In the OES program and in the New Hires Survey, R&P attaches the typical entry-level education, work experience in a related occupation, and on-the-job training necessary to work in the occupation as determined by BLS. While there may be alternative and multiple career paths to success in an occupation, the system used in this publication focuses

on the typical pathway as defined by BLS. For more information, see [https://stats.bls.gov/emp/ep\\_education\\_tech.htm](https://stats.bls.gov/emp/ep_education_tech.htm).

Education and training requirements for the 2016 OES estimates are provided in Table 13. Following the BLS standards, data reveal that almost 80% of jobs in Wyoming manufacturing in 2016 required no more formal education than a high school diploma or equivalent and that only 14% of jobs require a bachelor’s degree or higher. However, the BLS system of assigning education and training requirements may not be representative of employer requirements in Wyoming, nor does it acknowledge the role of employer provided training and related non-degree awards as discussed in “Training and Skills Needs in Manufacturing: Evidence from Past Research

**Educational Requirements**

Table 13: Typical Education Required to Enter an Occupation for Jobs Worked in Manufacturing (NAICS<sup>a</sup> 31-33) in Wyoming, 2016

Typical Education	N	%
No Formal Educational Credential	1,204	12.8
High School Diploma or Equivalent	6,319	66.9
Some College, No Degree	138	1.5
Postsecondary Non-Degree Award	304	3.2
Associate's Degree	154	1.6
Bachelor's Degree or Higher	1,317	14.0
<b>All Occupations</b>	<b>9,440</b>	<b>100.0</b>

<sup>a</sup>North American Industry Classification System.

Source: Occupational Employment Statistics May 2016 estimates. U.S. Bureau of Labor Statistics files using the LEWIS system.

Prepared by D. Hauf and M. Moore, Research & Planning, WY DWS, 4/25/17.

in Wyoming and National Initiatives” on page 26.

In addition, most students in postsecondary education work for pay at least some time during the school year. Many students in Wyoming use work as a means of financing their education (see *Wyoming’s Hathaway Scholarship Program: A Workforce Outcomes Evaluation of a State Merit-Based Scholarship Initiative Using Administrative Records*, available at [http://doe.state.wy.us/LMI/education\\_wconnect/hathaway2016/toc\\_hathaway.htm](http://doe.state.wy.us/LMI/education_wconnect/hathaway2016/toc_hathaway.htm)). It is clear that everyone brings at least some level of educational attainment to the manufacturing work environment. How educational attainment and the work environment interact to serve both employer and worker needs in the market is the focus of an expanding future study.

**Labor Supply: Stocks and Flows**

During peak seasonal periods of UI claims activity, between one-fifth and one-fourth of persons claiming weekly benefits against job loss from an employer located in Wyoming do so from a nonresident address.

However, during the peak of a cyclical downturn, more than one-third of all claims are filed from a non-resident address (Mohondro, 2016). The metaphor of “existing workforce strengths and deficiencies” implies an exclusive stocks approach to understanding Wyoming’s

labor market. However, the more fruitful metaphor revolves around the idea of understanding the flow of labor. If a flow metaphor is adopted, the focus shifts from a study of the temporarily static current workforce to the institutional systems, e.g. education,

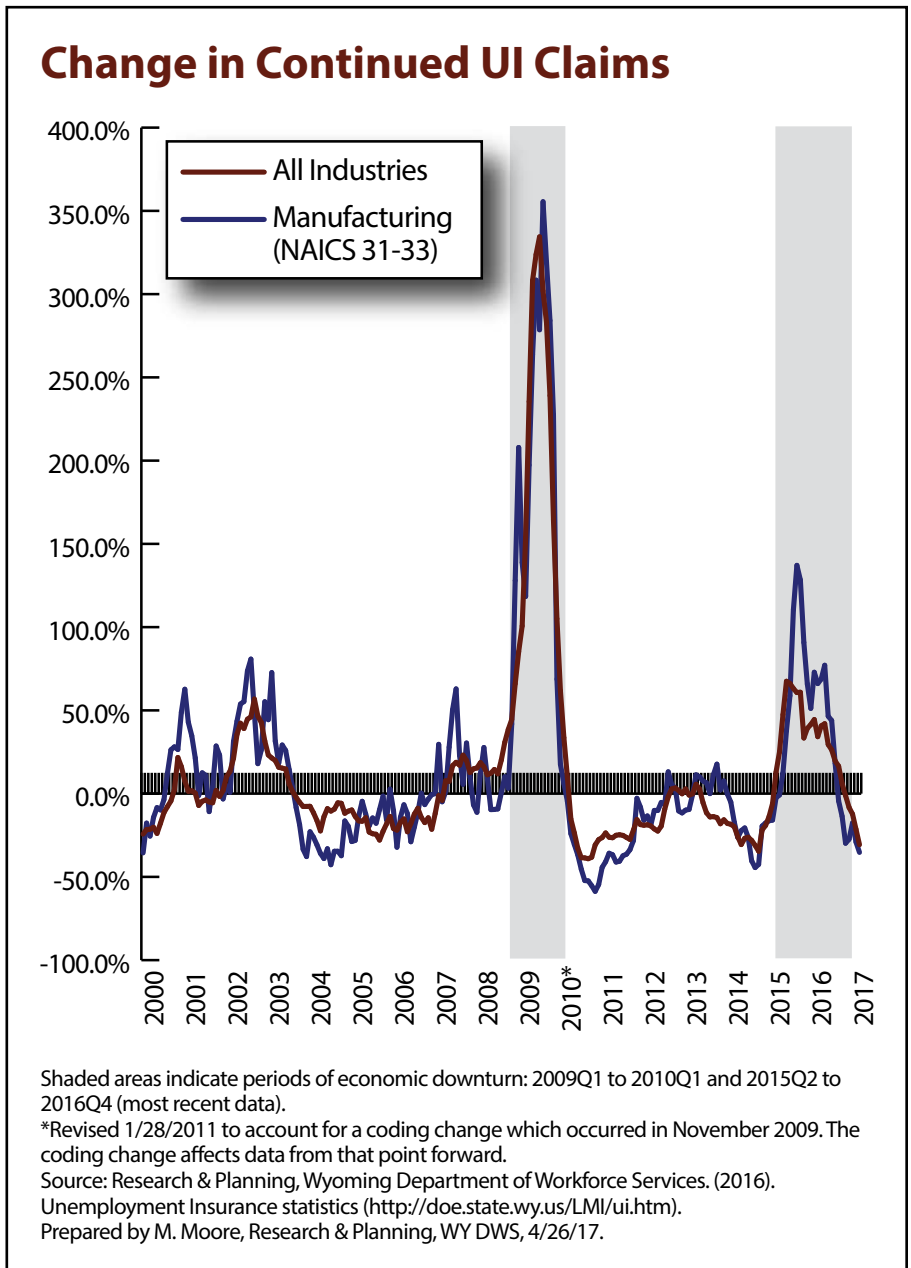


Figure 4: Over-the-Year Percentage Change in Continued Unemployment Insurance Continued Weeks Claimed, January 2000 to March 2017

market signals, and inducements to inter-state commuting and migration that channel and regulate the flow of labor over time.

Given the extensive connection between the processing of carbon-based mined products in manufacturing and the system of supporting manufactures (e.g. plastics and machinery), it is not unusual to find that UI claims activity follows a pattern similar to that of all industries when commodity prices change direction dramatically. Figure 4 (see page 20), which depicts the over-the-year percentage change in UI claims activity (a claim represents a request for weekly benefit amount and a person may file for two weeks at a time) from 2000 to present, clearly demonstrates the close correlation between claims activity in manufacturing

and statewide claims activity.

The number of persons (the workforce) claiming UI benefits underpinning the percent changes in Figure 4 can be found in Table 14. In 2015, the 963 persons who were claimants represented 8.2% of all persons whose primary industry of employment was manufacturing (see Table 1, page 5). In 2014, the 2,995 persons in manufacturing who claimed UI represented 24.8% of workers whose primary industry was manufacturing. The number of claimants decreased from 2014 to 2015, while weeks claimed increased (see Figure 4), indicating that the number of weeks claimed per claimant rose substantially. With the number of jobs decreasing across Wyoming’s labor market, the decrease in the number of manufacturing

### UI Benefit Recipients

Table 14: Selected Unemployment Insurance Benefit Recipient Data for Wyoming, 2001-2016

Year	Manufacturing			Nonresidents <sup>a</sup>				Total Claimants			
	N	Row %	Benefit Exhaustees N Rate	N	Row %	N	Rate	N	Row %	N	Rate
2001	879	5.7	140 15.9	5,230	33.6	1,003	19.2	15,553	100.0	2,597	16.7
2002	970	5.6	200 20.6	5,403	31.4	1,215	22.5	17,211	100.0	3,548	20.6
2003	1,173	6.2	301 25.7	5,281	27.9	1,584	30.0	18,896	100.0	5,258	27.8
2004	859	5.0	191 22.2	4,958	28.7	1,421	28.7	17,269	100.0	4,551	26.4
2005	729	4.9	167 22.9	4,465	30.1	1,205	27.0	14,824	100.0	3,623	24.4
2006	632	5.2	136 21.5	3,639	29.8	952	26.2	12,201	100.0	2,885	23.7
2007	784	6.0	151 19.3	3,837	29.4	934	24.3	13,064	100.0	2,804	21.5
2008	941	5.6	158 16.8	5,128	30.3	1,156	22.5	16,916	100.0	3,450	20.4
2009*	5,230	14.0	1,807 34.6	12,322	33.1	4,164	33.8	37,251	100.0	12,069	32.4
2010*	4,766	13.9	2,025 42.5	11,518	33.5	4,263	37.0	34,388	100.0	12,304	35.8
2011	4,195	15.1	1,356 32.3	9,494	34.2	3,120	32.9	27,756	100.0	8,710	31.4
2012	3,846	15.0	1,130 29.4	9,946	38.8	2,623	26.4	25,617	100.0	6,725	26.3
2013	3,771	15.8	1,041 27.6	9,529	39.9	2,462	25.8	23,854	100.0	6,098	25.6
2014	2,995	15.6	699 23.3	7,315	38.0	1,688	23.1	19,232	100.0	4,257	22.1
2015	963	4.2	187 19.4	5,198	22.8	1,468	28.2	22,753	100.0	4,880	21.4
2016	1,119	4.3	311 27.8	4,895	18.8	1,507	30.8	26,101	100.0	6,735	25.8

<sup>a</sup>Nonresidents are individuals for whom demographic data are not available.

Note: Nonresidents and manufacturing are not mutually exclusive. Benefit recipients in manufacturing may have also been nonresidents.

\*Revised January 31, 2011 to reflect a code change which occurred in November 2009.

Source: Unemployment Insurance Statistics. Research & Planning, WY DWS.

Prepared by M. Moore, Research & Planning, WY DWS, 4/26/17.

claimants and benefit exhaustees (claimants using all of the weeks to which they are entitled) is perhaps best explained by out-migration from Wyoming.

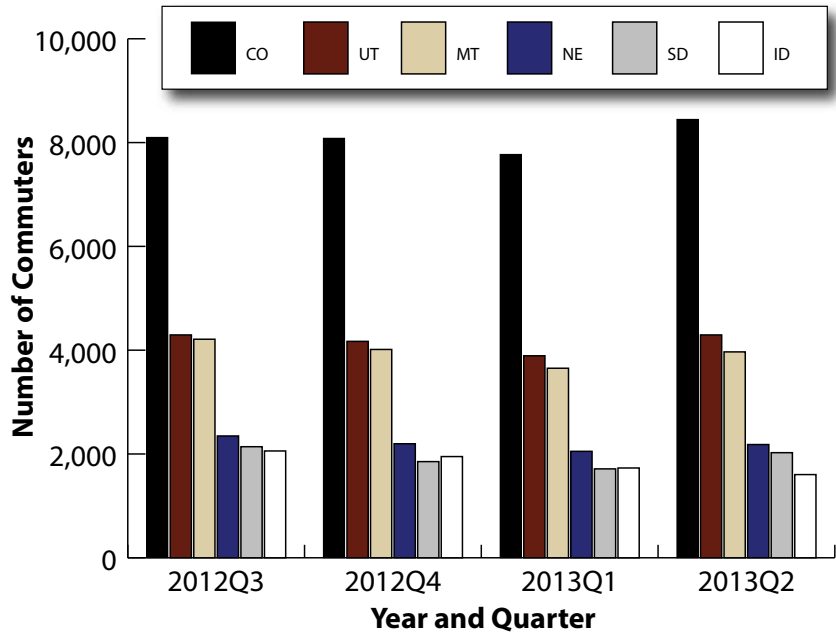
Table 15 shows the number of persons commuting to another county within Wyoming and the number of persons commuting from another

state into Wyoming. The peak seasonal quarter for commuting is the third quarter. In 2016Q3, 23.3% of all persons working in the state commuted across

### Commuting

Inter-state and intra-state commuting represents one mechanism the market uses to channel labor to high demand employment opportunities and to shed those workers when no longer needed. Commuting (see <http://doe.state.wy.us/LMI/commute.htm>) has both a seasonal and trend component. The distance commuted tends to be directly and positively related to earnings opportunity and the demographics of the workforce. In addition, commuting is a two way street.

### Commuting: Outflow



Source: Wyoming Wage Records database. Excerpted from Cowan, C., and Bullard, D. Understanding how commuting flows and job losses in other states could affect Wyoming's unemployment rate. *Wyoming Labor Force Trends*, 52(4). Retrieved from <http://doe.state.wy.us/LMI/trends/0415/a2.htm> Prepared by L. Mohondro, Research & Planning, WY DWS.

Figure 5: Wyoming Commuters into Border States, 2012Q3-2013Q2

### Commuting: Inflow

Table 15: Number of Persons Working in Wyoming by Place of Residency, 2016Q1 and 2016Q3

Year and Quarter	Total		Home County <sup>a</sup>		Inflow from Another Wyoming County or Another State or Country					
					Other WY County <sup>b</sup>		Nonresidents <sup>c</sup>		Total Inflow <sup>d</sup>	
	N	%	N	%	N	%	N	%	N	%
2016Q1	299,863	100.0	235,798	78.6	29,290	9.8	34,775	11.6	64,065	21.4
2016Q3	323,285	100.0	240,732	74.5	29,423	9.1	47,877	14.8	75,374	23.3

<sup>a</sup>Individuals who are employed in their county of residence.

<sup>b</sup>Individuals who commute to work from another Wyoming county.

<sup>c</sup>Individuals for whom demographic data are not available and commute to work in Wyoming for another state or country.

<sup>d</sup>All individuals who commute into a county from another Wyoming county or another state or country.

Source: Research & Planning Commuting Patterns based on Wage Records (County of Employment) and Wyoming Driver's License File (County of Residence).

Prepared by M. Moore, Research & Planning, WY DWS, 4/26/17.

a county or state line, with 14.8% coming from another state and 9.1% from another county.

Commuting by Wyoming residents to a surrounding state for work can be found in

Figure 5 (see page 22). This figure reveals that Colorado is the chief destination for over 8,000 residents of Wyoming who work in another state. As Figure 6 reveals, a significant number of Wyoming residents commute to surrounding states find work in

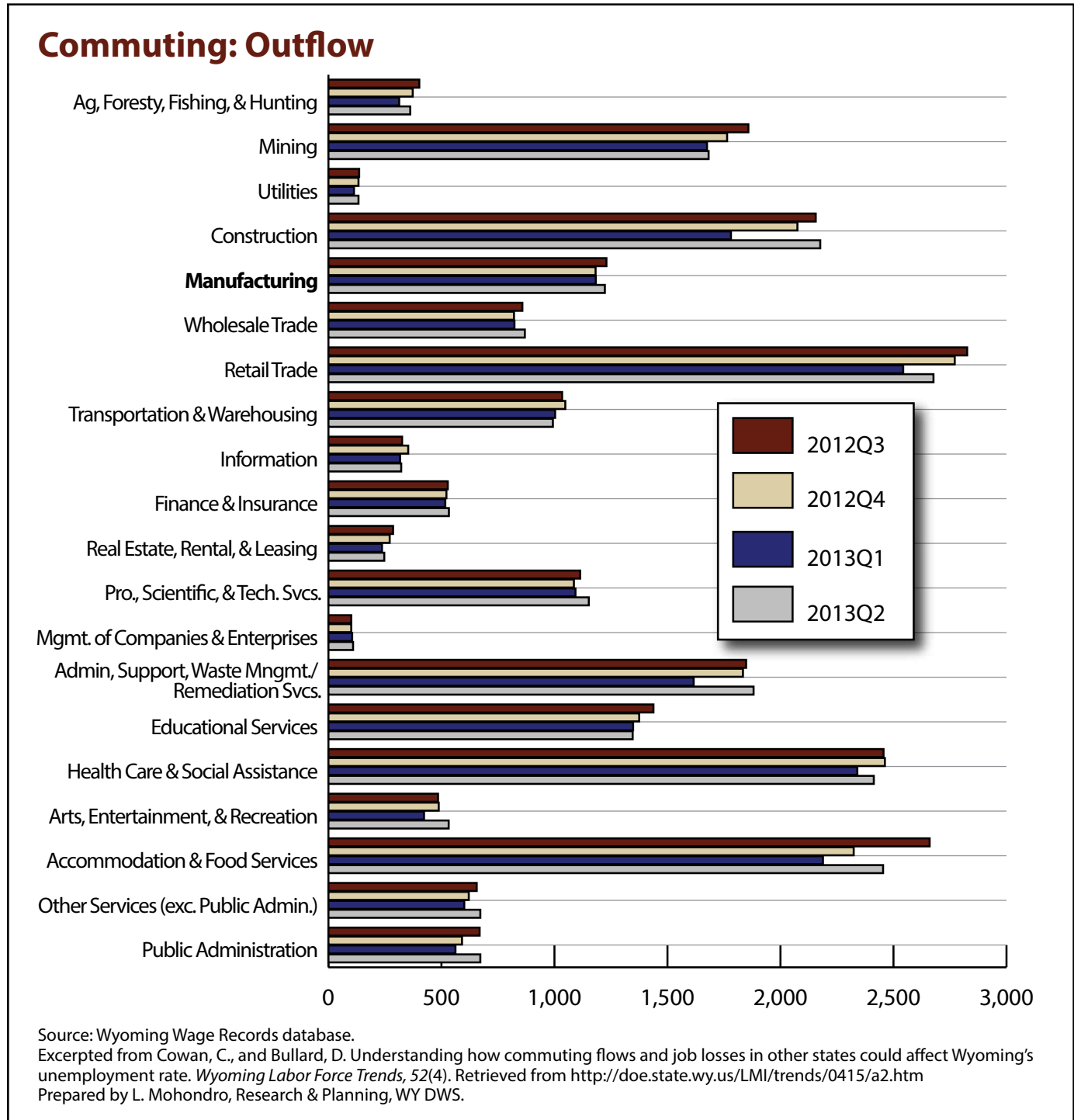


Figure 6: Wyoming Commuters into Border States by Industry, 2012Q3-2013Q2

the manufacturing industry. Both Figures 5 and 6 represent a time when jobs were increasing in Wyoming. Whether due to wage competition, a more efficient match between worker skills and employer needs, or simply a preference for where one resides, it is apparent that the workforce disregards state boundaries and that workers may reside in Wyoming and establish employer loyalty in other states. Indeed, with rapid expansion in employment opportunities among surrounding states, such as Colorado, Idaho and Montana, those markets may be increasingly attractive to Wyoming job losers.

The attractiveness of neighboring markets is relative, and building capacity to quantify the attractiveness of those markets is of potential interest in determining workforce development strategies for Wyoming.

Jobs in Wyoming’s manufacturing industry have experienced negative change for the past seven calendar quarters through 2016Q4, the most recent period for which payroll data are available (see Figure 7). Jobs have fallen by 7.9% (-798) since their quarterly peak in 2014Q4 during the last expansion while the

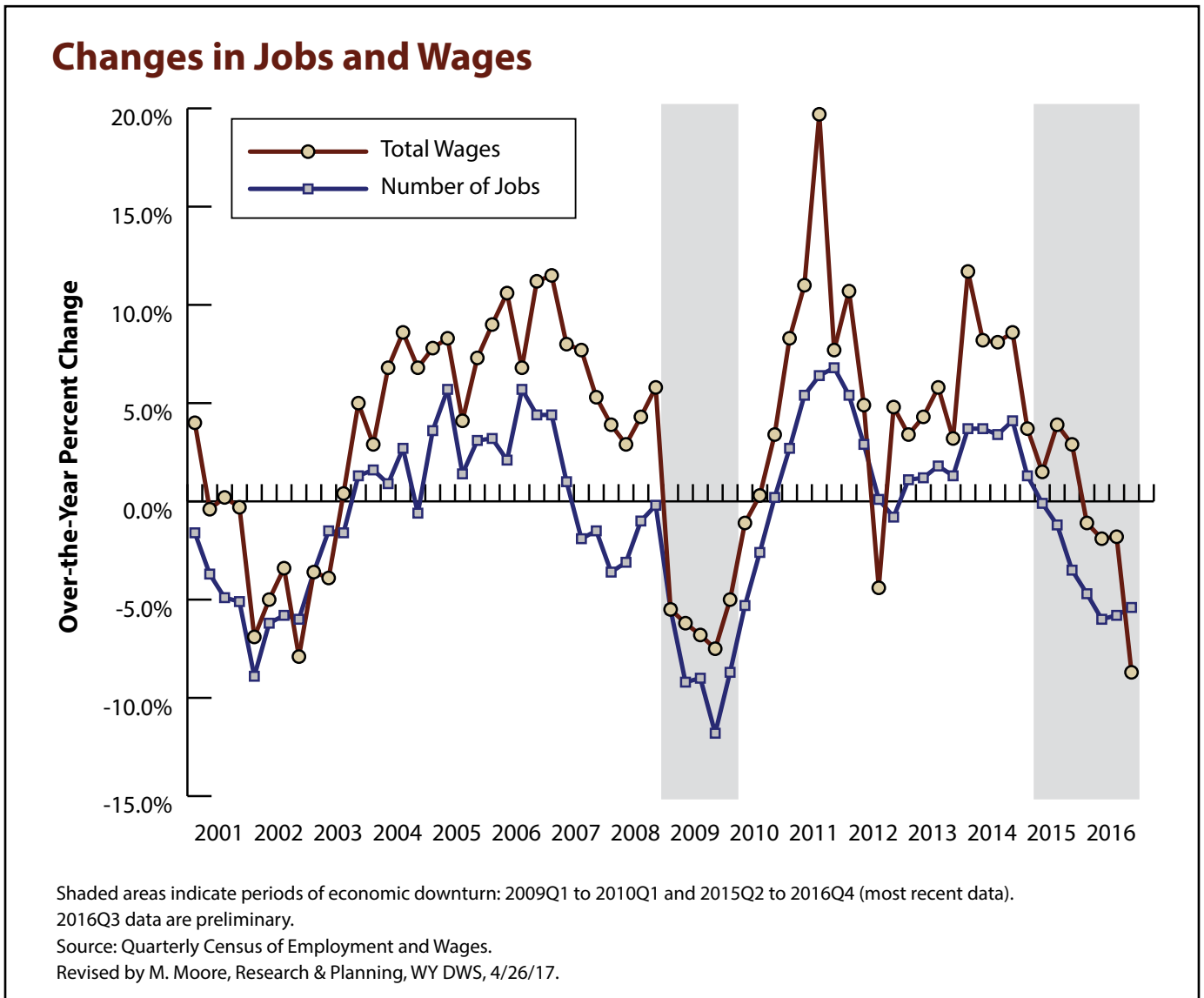


Figure 7: Over-the-Year Percent Change in Jobs Worked and Total Wages in Manufacturing in Wyoming, 2002Q2-2016Q4



payroll fell over the same period by \$9.5 million, or 6.0%. The annualized wage of the 798 jobs lost in 2016Q4 is almost \$48,000, which is consistent with median wages (\$45,456) in the general category of production occupations in Table 6 (see page 11).

Information on the occupations of jobs lost thus far in manufacturing's downturn from the UI claims record is of uncertain quality. However, since the average wage continues to increase in the early quarters of job loss, it seems most likely that lower wage helper and laboring production occupations that most frequently occur among new hires are the most likely to have been put out of work in the manufacturing industry. Since persons in these jobs tend to be relatively young among residents, and have a larger than average share of nonresidents among them, they may well have left the state entirely.

The manufacturing workforce today

is neither the same size nor comprised of entirely the same individuals as it was two years ago when the number of jobs stood at 10,116. It is unclear when, or with what strength, Wyoming's labor market will begin to recover. This uncertainty is exacerbated by the fact that the national economy is in the longest period of growth on record and cannot go on indefinitely. In the interim, the aging of manufacturing's workforce will create a need to hire replacements. Should the growth of jobs reappear, the occupations most frequently occurring among new hires probably represent the most likely skill sets required. Although the question is the subject of future research, it seems most likely that job loss in the manufacturing industry precipitated out-migration or an increase in commuting to other states for work. This means that should employment growth return, unless manufacturing can compete with other states on the basis of earnings, the pipeline for new workers is most likely to be local communities.

## Training and Skills Needs in Manufacturing: Evidence from Past Research in Wyoming and National Initiatives

by: *Katelynd Faler, Senior Economist*

Beginning in 2011, Research & Planning (R&P) published a series of articles about manufacturing (NAICS 31-33) in Wyoming. R&P found that Wyoming's manufacturing industry accounted for a much smaller percentage of employment compared to the U.S. overall, and that manufacturing in Wyoming accounted for a smaller ratio of economic output than nationally (Manning, 2011). Moore (2011) examined employee turnover in the manufacturing industry for May 2010, and found that management (SOC 11-0000), office & administrative support (SOC 43-0000) and installation, maintenance, & repair occupations (SOC 49-0000) appeared to have a longer tenure with their employer than occupations like industrial truck & tractor operators (SOC 53-7051), and therefore suggested caution when offering training for jobs with a high turnover rate. Moore also found that manufacturing employers often filled positions with high projected annual openings internally, meaning that employers had to arrange training internally or pay for outside training.

Of the 11 skills mentioned in R&P's New Hires Survey between fourth quarter 2009 (2009Q4) and third quarter 2010 (2010Q3), Saulcy (2011) found that employers most commonly reported critical thinking and operation and control as important skills, and manufacturing employers overall were satisfied with their new hires' skills. In the 2011 article "Examining the Gender Wage Gap among New Hires in Wyoming's Manufacturing Industry," Glover reported that R&P collected information on 11

occupations within the manufacturing industry between 2009Q4 and 2010Q3. There were no significant wage differences for eight of the 11 occupations. However, there were three occupations in which newly hired males made significantly more than their female counterparts. Glover noted that other variables which could account for the wage gap, such as age and industry experience, were not considered in this case.

According to Knapp (2011), "in July 2011, R&P was hired by the Manufacturing-Works program at the University of Wyoming to conduct a survey of training needs among the state's manufacturers." The survey, designed by Gallagher (2011), was based on questionnaires from the National Association of Manufacturers (<http://www.nam.org/>). Survey reports indicated that 81.0% of employers provided all training internally, and 19.5% of employers needed outside training. Employers reported that training in leadership skills were commonly needed, but "employers felt that very few of their jobs needed any type of safety training (Knapp, 2011)." The questionnaire is available at [http://doe.state.wy.us/lmi/trends/0711/mfg\\_questionnaire\\_final.pdf](http://doe.state.wy.us/lmi/trends/0711/mfg_questionnaire_final.pdf).

The Manufacturing Institute suggests there may be good reason to offer internal, third-party, or otherwise non-credited training in "Growing your Skilled Workforce: A Toolkit for Manufacturers on Implementing the NAM-Endorsed Skills Certification System." The publication specifically lists

the advantages of non-credit courses including speed and flexibility in creating new courses, customizable content for specific industries and employers, and ease of access for current employees (Growing Your Skilled Workforce, 2015, p. 17). While R&P collects survey data on new hires, administrative data on credited certifications such as certificates and degrees from Wyoming community colleges, the University of Wyoming, and the National Student Clearinghouse, and detailed records of training offered through the Wyoming Department of Workforce Services, R&P does not have access to non-credit trainings offered internally by employers or by third parties. Lack of data on internal or third-party training may represent a critical gap in R&P's understanding of Wyoming's manufacturing industry, as an estimated 81.0% of employers offer all of their training internally.

Furthermore, intermittent funding has limited R&P's ability to provide a detailed, longitudinal analysis of Wyoming's manufacturing workforce. Nationwide statistics and a historic, rust belt perception of manufacturing simply do not apply to Wyoming where manufacturing often depends on the mining, oil & gas industry. R&P's previous work outlined a snapshot of manufacturing as it existed at one

point in time, but future research could include:

- An assessment of the efficacy of training for employees in manufacturing through funds provided by the Department of Workforce Services
- An estimate of the growth and decline of specific sectors in manufacturing based on numerous economic factors
- An evidence-based approach to assessing manufacturing skills shortages in Wyoming's economy
- A comparison of changes within the manufacturing industry to regional manufacturing
- A study of current and historic changes in manufacturing in other states with similar demographic and economic characteristics

Lower crude oil prices, which have persisted since 2014 (Energy Information Administration, 2017), have left Wyoming with higher unemployment, reduced workforce opportunities, and relatively inexpensive natural resources. A targeted, data-driven approach may help to appropriately grow Wyoming's manufacturing industry.

## Findings and Results

by: Tom Gallagher, Research & Planning Manager

Depending on the context, a finding can be viewed as displaying both strengths and deficiencies. This section describes Wyoming workforce assets that may be built upon and limitations. For example, from the standpoint of industrial and occupational diversity, even though a significant minority of jobs are concentrated in a small number of energy-related sub-sectors, manufacturing employment exhibits a wide variety in its industrial composition. However, small size may limit the synergy among firms and industries.

Current economies of scale may serve as a barrier and limitation to greater manufacturing employment even though individual firms within a sub-sector may be very successful.

Given that a significant share of manufacturing jobs in Wyoming are tied directly or indirectly to carbon-based exports, employment in much of the industry follows the same trends as the mining industry. Retrieving workers who left during a downturn at the point of returning growth seems problematic.

### A note on the research

The information available to R&P at the moment this report was called for represents only part of what should become of much greater value, and should be the opening of a dialogue with a diverse group of firms in manufacturing. In addition, given the short time frame, certain segments of study, e.g. occupational projections, and the births, growth, and demise of firms, were not undertaken. Through data sharing agreements with state research offices in other states, we could determine how many workers who left manufacturing jobs in Wyoming went to work in another state and the earnings and industry of their employment.

We know little about employer-provided training, or non-credit certifications upon which employers depend. These may result in improved employment outcomes for workers.

Research-based analysis, or monitoring of manufacturing beyond the basics of quarterly and annual employment, occupational distribution, wage rates, earnings levels, turnover, and demographic profiles, is only funded on an irregular and episodic basis. *Flow information*, or publishing information on the pipeline from education to work by credential, is limited to the New Hires Survey, which is conducted by R&P. We are only at the beginning of tracking human resources from the education system into the manufacturing industry longitudinally with administrative records. Commuting flow analysis data have been produced for several years; however, statistical modeling of workforce flows by credential, and the capacity to produce customized scenarios based on models that include demographics, commuting, work history, and credentials is underway.

As a result of dependence on a nonresident workforce, a significant share of Wyoming manufacturing payroll and UI benefits are spent out of state. Nonresident workers are less likely to establish a commitment to the communities in which they work. At the same time, the state externalizes the social cost of job loss. Hiring nonresidents also implies higher recruitment and job search costs than would occur were labor more readily available locally. The hiring of nonresidents also tends to take place, although not exclusively, among production laborers and helpers.

The vast majority of manufacturing jobs in Wyoming do not require formal education beyond high school, although our knowledge of employer-specific requirements for education is very limited, and the extent to which employers provide training is dated.

Postsecondary programs that provide trained workers to manufacturing appear to be producing an ample supply of graduates, and earnings are substantial for those who find work in manufacturing. Some occupations requiring post-secondary skills may not be meeting employers requirements. However, this finding needs further study.

A maturing workforce is at its earnings peak as a function of experience. However, the reality of an aging workforce requires that policy makes plans for the transfer of institutional knowledge and meeting replacement needs.

Relatively higher earnings and wages, access to benefits, workplace stability, longer tenure, and availability of UI benefits are assets in recruitment of workers and to the communities in which they reside.

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